Digital and Composite Waveform Rasterizers

▶ WVR7000 Series • WVR7100

▶ WVR7000 Series Rasterizer.

The first model of the WVR7000 Series rasterizers, the WVR7100, broadens the Tektronix line of waveform rasterizer solutions by introducing support for HD monitoring applications – options to add SD and composite analog monitoring can be selected. Analog, digital, or embedded audio monitoring options can also be selected. With the WVR7000 Series, you can now monitor HD, SD, Analog Composite video, as well as Analog and Digital audio all from a single, convenient 1 RU instrument.

Powerful Display Flexibility – FlexVu™

To maximize application flexibility, a high-resolution, tiled display design lets users customize presentation of information for each operation they wish to perform. Waveform, vector, gamut, audio (optional), status and picture monitor displays can be combined with line select, gain and magnification in nearly unlimited combinations. These instruments offer a number of exclusive displays that speed and simplify the monitoring and measurement tasks, continuing the Tektronix tradition of measurement leadership.

▶ **Features & Benefits**

Base Unit Supports HD-SDI (292 M) Monitoring – Options to Add SD-SDI (ITU-R BT.601) and Analog Composite Monitoring

Analog, Digital and Embedded Audio Monitoring

High-resolution XGA Output for Crisp, Easy-to-Read Displays

FlexVu™ Display – Unique, Flexible Tiling for True "Four Instruments in One" Capability

Easy to Use and Learn Enabled by FlexVu, Intuitive User Interface, Backlit Buttons and On-line Help

Fully Digital Processing for Accurate, Repeatable, Drift-free Operation

Exclusive Tektronix Gamut Displays Ensure Compliant Content

Passive Loopthroughs (SDI and analog inputs) Allow for Monitoring the True Signal in the Path and Ensuring Signal Integrity, Even if the Instrument Power is Off

Patented Tektronix Timing Display Makes Facility Timing Easy

A Variety of Remote Control Configurations for Complete Installation Flexibility

Instrument Presets for Quick Recall of Commonly Used Configurations

Exclusive Session Screens for Content Status at a Glance

Digital Cursors for Precise Timing and Amplitude Measurements

Line Select with Field and Picture Bright-ups

Extensive Alarming and Error Logging Screens

Temperature-dependent Internal Fans Optimize Cooling and Noise

▶ **Applications**

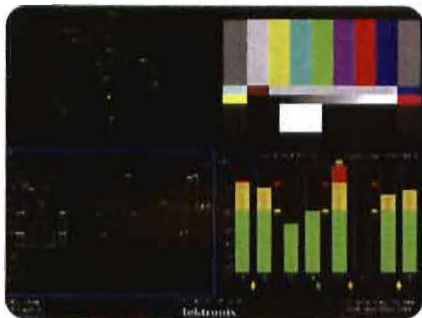Confidence Monitoring of High Definition (HD), Standard Definition (SD) and Composite Signals

Content QA and Compliance Checking

Post production

Tektronix

Enabling Innovation

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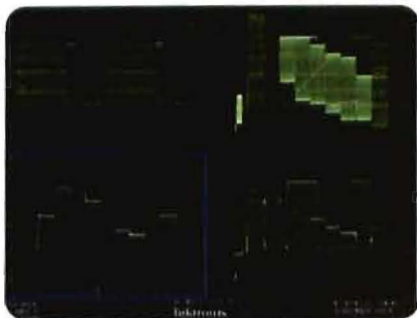
▶ Four different views of the same signal.

▶ Lightning display showing correctly aligned signal.

▶ Diamond, Split Diamond and Arrowhead shown in conjunction with a summary of all video errors.

Waveform Displays

A complete range of display options lets users choose between parade or overlay presentation of SDI signals in RGB, YPbPr, YRGB or composite formats. Full horizontal timing flexibility is provided with 1Line, 2Line, 1Field and 2Field sweep modes, with or without timing magnification. Both fixed and variable vertical gain are offered, each with the outstanding accuracy and repeatability that comes from a fully digital design. High-performance composite waveforms are available in the WVR7000 Series. Wide bandwidth and outstanding display quality combine to let users discern even the finest details. A variety of filtering options allows optimized presentation of information.

Vector Displays

The vector display is offered with selectable 75% and 100% targets. Each display automatically selects the appropriate graticule based on the input format. The patented Tektronix Lightning display provides unique insight not available in traditional vector displays – allowing users to visualize both luma and chroma amplitudes, as well as quantify inter-channel timing, without taking the equipment out of service.

Gamut Displays

Monitoring for gamut compliance is also available in the WVR7000 Series. The patented Tektronix Diamond and Split Diamond displays enable the operator to visualize whether the content is RGB gamut compliant with a single glance. Plus, they are designed to help isolate the out-of-gamut component just as easily.

For SDI component content that is destined for broadcast in composite systems, the unique Tektronix Arrowhead display can be used to monitor composite gamut compliance without the need for a separate encoder. Within this display, a separate upper and lower luma-only gamut limit can be applied. The power of the FlexVu™ display in the WVR7000 Series lets you monitor the Diamond and Arrowhead displays simultaneously for complete confidence in content compliance throughout the delivery chain.

Each of these displays offers user-selectable gamut thresholds so operators can set monitoring limits appropriate to their specific operation. In addition, gamut monitoring is fully integrated with the powerful alarm logging and reporting capability of the WVR7000 Series.

Audio Displays (Optional Capability)

Available in the WVR7000 Series are a range of audio options that can add comprehensive audio monitoring capabilities for analog audio and digital audio. Level bars display, or both bars and a Lissajous display, can be selected to provide monitoring for digital audio formats, embedded or externally input up to four stereo pairs, or for up to two sets of six balanced analog inputs. The level meters offer selectable meter ballistics and scaling. Analog audio scales can be set to dBu, DIN, Nordic, VU or IEEE PPM. Digital audio scales are available for dBFS and can be user configurable. These instruments have a set of two programmable levels designed to optimize detection of out-of-range conditions in analog signals, or in digital signals derived from analog sources. The over and silence settings augment digital clip and mute detection by letting users select levels to represent these conditions in the analog audio domain.

In addition to audio displays, a full range of audio error conditions can be selected for monitoring, including AES unlock, parity errors and checksum errors.

▶ A summary of audio errors is combined with level bars and Lissajous, picture monitor and vector.

Status Displays

The WVR7000 Series offer a variety of displays designed to show status at a glance, in addition to the status bar continually displayed at the bottom of the screen.

A comprehensive overview of the video content status is presented in the video session screen. Offering a time-based compilation of information, this screen is ideal for presenting evidence of compliance after content screening. Information on input format and session time is presented, along with statistics on Error Detection and Handling (EDH) Cyclic Redundancy Check (CRC) errors and gamut errors. Information is presented in errored seconds, errored frames and percentage of total frames - together providing a unique quantitative insight to content quality.

▶ Audio and video summary statistics combined with a gamut display.

When one of the audio options is installed, an audio session screen is available to confirm evidence of compliance. This screen records the highest true peak, as well as the number of mutes, clips, overs and silences during the session time. An alarm status screen can also be displayed providing up-to-the-moment information on the state of each condition currently being monitored by the instrument. To support unattended monitoring applications, as well as provide documentation for service level agreements, the system maintains a log of all monitored alarms, time stamped with Vertical Interval Time Code (VITC), Longitudinal Time Code (LTC), Ancillary Time Code, and time of day references.

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Timing Display

This intuitive display makes facility timing easy allowing a simple graphical interface to clearly show the timing offsets between HD and SD signals relative to the reference. The patented Tektronix Timing display presents a unique timing comparison between a digital (SD or HD) or analog composite signal and a house reference signal (composite or tri-level sync), thus eliminating the complexity in timing SD and HD signals. Timing differences are displayed numerically in terms of vertical lines and horizontal time in μsec relative to the house reference signal. A simple graphical display shows the relative timing of the input signal (the circle) vs. the reference signal (the crosshair). When the two signals are properly timed, the circle changes from a red to green color and is concentric with the crosshair.

▶ Intuitive Timing display.

▶ Remote front panel.

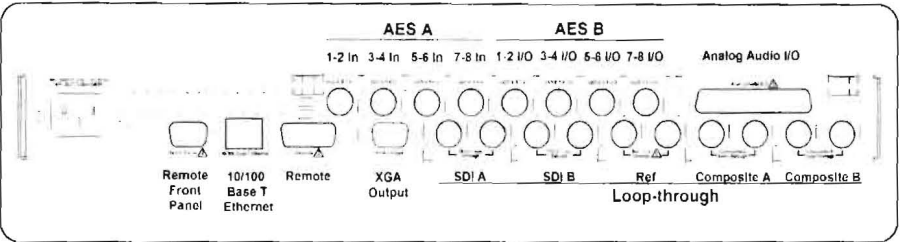▶ WVR7100 back panel with audio options.

Picture Monitor Display

For a qualitative view of the content, a full-color picture monitor is offered, which can be displayed either in a single tile or as a full-screen presentation. This display is compatible with all input formats and features automatic adjustment for aspect ratio and number of active lines.

Remote Access and Control

Powerful and flexible remote control features help users integrate these instruments into a variety of remote monitoring scenarios. The WVR7000 Series can be remotely accessed and controlled through a variety of mechanisms: Remote front panel, web interface, ground closure, and SNMP.

The newly introduced remote front panel allows the operator to access and control the base unit from a distance of up to 100 ft. using a cable. The remote front panel is similar to the front panel on the instrument.

Using the built-in 10/100Base-T Ethernet port, users can remotely control every major feature of the instrument and view the display as well as download the alarm log and print the screen contents for easy record keeping. This powerful Java application offers a variety of control options to suit individual preferences, and allows you to create and recall an unlimited number of instrument presets. Where simplified interfacing is the dominant requirement, a ground-closure type remote interface provides access to recall of instrument presets and an alarm signal output. The ground-closure interface is ideal for use in master control scenarios or in outside broadcast applications.

► Characteristics

Video Input and External Reference Formats Supported

Automatic Detection of a Wide Range of Signal Formats

The WVR7000 Series rasterizer accepts a wide variety of input signal formats and external references. The following chart illustrates all the video inputs (first column), cross-referenced with their compatible external references.

SUPPORTED INPUT FORMATS	EXTERNAL REFERENCE INPUTS									
	NTSC	PAL	720p			1080p/sF		1080i		
	59.94 Hz	50 Hz	50 Hz	59.94 Hz	60 Hz	23.98 Hz	24 Hz	50 Hz	59.94 Hz	60 Hz
NTSC 59.94 Hz[1]	X									
PAL 50 Hz[1]		X								
483i, 59.94 Hz (525), BT601[2]	X			X					X	
576i, 50 Hz (625), BT601[2]		X	X					X		
720p, 23.98 Hz	X			X		X			X	
720p, 24 Hz							X			X
720p, 25 Hz		X	X					X		
720p, 29.97 Hz	X			X					X	
720p, 30 Hz					X					X
720p, 50 Hz		X	X					X		
720p, 59.94 Hz	X			X		X			X	
720p, 60 Hz					X		X			X
1035i, 59.94 Hz	X			X					X	
1035i, 60 Hz					X					X
1080i, 50 Hz		X	X					X		
1080i, 59.94 Hz	X			X					X	
1080i, 60 Hz					X		X			X
1080p, 23.98 Hz	X			X		X			X	
1080p, 24 Hz					X		X			X
1080p, 25 Hz		X	X					X		
1080p, 29.97 Hz	X			X					X	
1080p, 30 Hz					X					X
1080sf, 23.98 Hz	X			X		X			X	
1080sf, 24 Hz					X		X			X
1080sf, 25 Hz		X	X					X		
1080sf, 29.97 Hz	X			X					X	
1080sf, 30 Hz					X					X

[1] Available with the purchase of Opt CPS.

[2] Available with the purchase of Opt SD.

The monitor will automatically detect the signal format and establish the appropriate settings for the various displays. You can select an expected signal format from the list of supported formats. If the expected format and detected format differ, the instrument will report a format mismatch.

The instrument will signal a format mismatch if the applied external reference format is not compatible with the input signal.

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Serial Digital Video Interface

Inputs –
2, only one active at a time. if SD option is enabled, the inputs autodetect between HD and SD inputs.

Input Type –
Passive loopthrough BNC, 75 Ω compensated.

Input Level –
800 mV$_{p-p}$, ±10%

Return Loss –
≥25 dB from 1 MHz to 270 MHz, power on.
≥15 dB from 1 MHz to 270 MHz, power off.
>15 dB from 1 MHz to 1.5 GHz, power on or off.

Loopthrough Insertion Loss –
For HD, equivalent to 10 m of type 8281 cable.

Loopthrough Isolation –
>50 dB to 300 MHz.

Receiver Equalization Range –
Typically for SD, to 250 m of type 8281 cable; for HD to 100 m of type 8281 cable.

Composite Video Interface (Option CPS)

Formats Supported –
NTSC, NTSC no setup; PAL I, B, D, G, and H

Inputs –
2, only one active at a time.

Input Type –
Passive loopthrough BNC, 75 Ω compensated.

Input Dynamic Range –
±6 dB.

Maximum Operating Amplitude –
−1 8 V to +2.2 V, DC + peak AC

Absolute Maximum Input Voltage –
−6.0 V to +6.0 V, DC + peak AC.

DC Input Impedance –
20 kΩ, nominal.

Return Loss –
>40 dB to 6 MHz, inputs and power on. typical 35 dB with power off

Cross-talk Between Channels –
>60 dB to 6 MHz.

Loopthrough Isolation –
>70 dB to 6 MHz.

DC Offset with Restore On –
<2 mV.

DC Restore 50 Hz and 60 Hz Attenuation –
Fast mode >95% attenuation, slow mode <10% attenuation.

Lock Range –
±50 ppm remains locked.

External Reference

Sync Formats –
NTSC and PAL and Tri-level Sync.

Input Type –
Passive loopthrough BNC, 75 Ω compensated.

DC Input Impedance –
20 kΩ, nominal.

Return Loss –
>40 dB to 6 MHz, >35 dB to 30 MHz.

Lock Range –
±50 ppm.

Monitor Output

Signal Format (XGA D-sub Output) –
1024x768, 60 Hz vertical rate.

Serial Digital Waveform Vertical Characteristics

Vertical Measurement Accuracy –
At X1 gain, ±0.5% of 700 mV full scale; at 5X gain, ±0.2% of 700 mV full scale.

Gain –
1X, 5X, variable range 0.25X to >7.5X.

Frequency Response –
SD: Luminance (Y) channel ±0.5% to 5 75 MHz, Color Difference channels (Pb, Pr) ±0.5% to 2.75 MHz.
HD· Luminance (Y) channel ±0.5% to 30 MHz, Color Difference channels (Pb, Pr) ±0.5% to 15 MHz.

Analog Composite Waveform Vertical Characteristics (Option CPS)

Vertical Measurement Accuracy –
±1% all gain settings.

Gain –
1X, 5X, variable range 0.25X to >7.5X.

Frequency Response –
Flat to 5 75 MHz, ±1%

Waveform Horizontal Deflection

Sweep Timing Accuracy –
±0.1%.

Sweep Linearity –
±0.1%.

Audio Characteristics (Optional Capability)

Level Meter Resolution –
0.056 dB steps at 30 dB scale from full scale to –20 dBFS; 0.20 dB steps at 70 dB scale for signals above –20 dBFS.

Meter Ballistics –
True peak, PPM type 1, PPM type 2, extended VU.

Defined/Programmable Level Detection –
Mute, clip, user programmable silence, over.

Level Meter Accuracy Over Frequency –
–0.5 dB (for analog), –0.2 dB (for digital) from 20 Hz to 20 kHz, 0 to –40 dBFS sine wave, Peak Ballistic mode except for some submultiples of the 48 kHz sampling frequency.

Digital Audio (Options DG and DA)

AES Inputs –
2 sets of 8 channels each, 32 kHz, 44.1 kHz, 48 kHz, 96 kHz, 24-Bit

AES Input Characteristics –
BNC, 75 Ω terminated, unbalanced, 0.2 V to 2 $V_{p\text{-}p}$.

AES Input Return Loss –
>30 dB relative to 75 Ω from 0.1 to 6 MHz.

AES Outputs (from embedded sources) –
Up to 8 channels, 48 kHz, 20-Bit for SD and 24-bit for HD

AES Output Characteristics –
BNC, 75 Ω terminated, unbalanced, 0.9 V to 1.1 $V_{p\text{-}p}$ into 75 Ω.

AES Output Return Loss –
>25 dB relative to 75 Ω from 0.1 to 6 MHz.

AES Output Jitter –
3.5 nsec, peak, typical, with 700 Hz high-pass filter per AES specification.

Analog Audio (Option DA)

Analog Inputs –
2 sets of 6 channels each.

Analog Input Characteristics –
Balanced, unterminated via 37-Pin D-sub connector.

Cross Talk –
<88 dB

Input Impedance –
35 kΩ, typical.

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► Ordering Information

WVR7100

Base unit supporting HD Serial Digital Monitoring (2 passive loopthrough inputs).

Please specify Power Plug when ordering.

Options

Opt. SD – Add SD-SDI (ITU-R BT.601) monitoring. Uses same physical inputs as the HD- autodetect between SD and HD.

Opt. CPS – Add Analog Composite monitoring. Two passive loopthrough inputs.

Opt. RFP – Remote Front Panel capability. With the purchase of this option, WVR7000 Series base unit will be shipped with an installed dummy front panel, a fully functional remote front panel and 25-foot cable.

Opt. DG – Digital audio monitoring capability.

Opt. DA – Digital and analog audio monitoring capability (see optional accessories)

Note. Options must be ordered when base unit is purchased.

Power Plug Options

Opt. A0 – US Power.

Opt. A1 – Euro Power.

Opt. A2 – UK Power.

Opt. A3 – Australian Power

Opt. A5 – Swiss Power.

Opt. A6 – Japan Power.

Opt. A10 – China Power.

Service Options

Opt. C3 – Calibration Service 3 Years.

Opt. C5 – Calibration Service 5 Years.

Opt. D3 – Calibration Data Report 3 Years (with Option C3).

Opt. D5 – Calibration Data Report 5 Years (with Option C5).

Opt. R3 – Repair Service 3 Years.

Opt. R5 – Repair Service 5 Years.

Optional Accessories or Items

012-1658-00 – Analog audio breakout cable, 6 feet, male 37 pin D connector to 6 XLR male output connectors and 12 XLR female input connectors.

WVRRFP – Separate remote front panel (including 25-foot cable). Order this when you need a fully functional front panel on the unit and a fully functional remote front panel.

012-1682-00 – 100-foot cable for use with Remote Front Panel (WVRRFP or Opt. RFP).

Upgrades

Check www.tektronix.com for new firmware downloads.

Our most up-to-date product information is available at
www.tektronix.com

Product(s) are manufactured in ISO registered facilities

CE ISO 9001

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